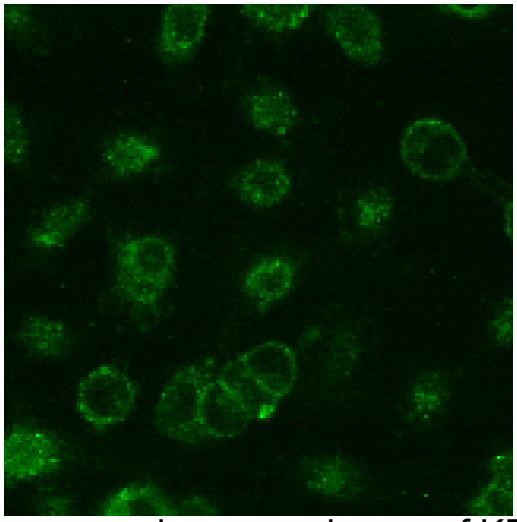
Cancer Targeting with Thermoresponsive Core/Shell Nanogels

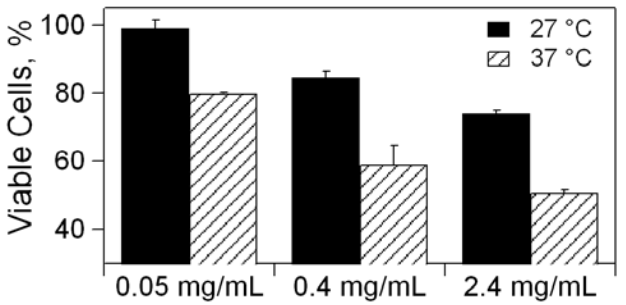
L. Andrew Lyon, Georgia Institute of Technology, DMR-0203707

In order to enable effective cancer chemotherapy without overt harm being done to normal tissues, it is necessary to target the therapeutic agent to the diseased area with a high degree of fidelity. While a number of strategies aimed at that goal exist, significant hurdles must be overcome before an effective targeting strategy can be designed *de novo* for a particular disease state. The goal of this research is to design core/shell hydrogel nanoparticles able to target, enter, and deliver a cytotoxic payload to the cancer cell. We have accomplished the first two steps in this goal by using folate-modified nanogels to target and kill cancer cells *in vitro*.

J. Am. Chem. Soc., in press (2004)



Fluorescence microscope image of KB cells with internalized, fluorescent, folate-modified core/shell nanogels.



Temperature-dependent cytotoxicity brought about by inducing cytosolic nanogel deswelling.

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Education:

Under this grant, two students have completed their Ph.D. degrees: Dr. Clinton Jones (post-doc at Penn State Univ.) and Dr. Justin Debord (soon to be a post-doc at NRL) and one post-doctoral scientist has been trained: Dr. Daoji Gan (Promerus). Two undergraduate students have also participated in this research: Mr. Thomas Fitzpatrick and Ms. Kristin Yarmey (Summer 2003 REU program) Currently, four Ph.D. graduate students: Mr. Jonathan McGrath (3rd year), Mr. Satish Nayak (5th year), Ms. Neetu Singh (2nd year) and Mr. Bart Blackburn (2nd year) are involved in this project.

Broader Impacts:

This research grant has spawned this highly successful collaborative effort between the Lyon group and the group of Prof. Jean Chmielewski at Purdue. This has given students in the Lyon group the opportunity to learn about cell culture techniques and modern cancer therapies. Work that began with fundamental material structure/property relationships has now grown into an effort that has great potential to have a positive impact on targeted chemotherapies. This work is also being translated into efforts in bioresponsive materials for a new class of materials for biological sensing.